Amendments to the Claims

What is claimed is:

1. **(Currently Amended)** A method for reconstructing a bioluminescent source distribution within an object, comprising:

    imaging the object using a tomographic imaging modality to produce a first reconstructed image;

    mapping optical absorption and scattering properties of the object to the first reconstructed image; and

    detecting optical signals emitted from the object using an optical imaging modality to produce a bioluminescent source distribution in the object~~,~~ based on the mapped optical properties, wherein the bioluminescent source distribution is produced based on a single- or a multi-spectral radiative transport equation or an approximation to the multi-spectral radiative transport equation.

2. **(Original)** The method of claim 1, wherein the first reconstructed image shows two or three dimensional structural details of the object.

3. **(Previously Presented)** The method of claim 1, wherein the bioluminescent source distribution shows two or three dimensional distribution of light emission from the object.

4. **(Previously Presented)** The method of claim 1, wherein the bioluminescent source distribution is reconstructed to represent multiple types of source distributions with various spectral characteristics.

5. **(Previously Presented)** The method of claim 1, wherein bioluminescent source distribution is reconstructed from a single or multiple angles of view.

6. **(Previously Presented)** The method of claim 1, wherein the bioluminescent source distribution is reconstructed using an iterative or analytic approach.

7. (**Original**) The method of claim 1, wherein the step of detecting optical signals uses sensors.

8. (**Original**) The method of claim 7, wherein the step of detecting optical signals also uses optical path components.

9. (**Previously Presented**) The method of claim 1, wherein the bioluminescent source distribution shows cross-sectional or volumetric views of the object or quantitative features of underlying source distributions of the object.

10. (**Original**) The method of claim 1, wherein the optical properties include at least one of absorption coefficients, scattering coefficients, scattering anisotropy, indices of refraction, and features of underlying sources.

11. (**Previously Presented**) The method of claim 1, wherein the tomographic imaging modality includes at least one of x-ray computed tomography, micro computed tomography, magnetic resonance imaging, and ultrasound.

12. (**Previously Presented**) The method of claim 1, wherein the optical imaging modality includes at least one of bioluminescent tomography and fluorescent tomography.

13. (**Original**) The method of claim 1, further comprising segmenting the first reconstructed image into regions, wherein the step of mapping maps the optical properties to each segmented region of the image.

14. (**Previously Presented**) The method of claim 1, further comprising registering the first reconstructed image with the detected optical signals before producing the bioluminescent source distribution.

15. (**Original**) The method of claim 14, wherein the step of registering uses a landmark-based method, a land-mark free method, or an optical surface imager method.

16. (**Currently Amended**) A system for reconstructing a bioluminescent source distribution within an object, comprising:

a tomographic imaging device for imaging the object using a tomographic imaging modality to produce a first reconstructed image;

a library of optical absorption and scattering properties of the object, based on data measured previously using an optical imaging modality;

a processor for mapping the optical absorption and scattering properties of the object to the first reconstructed image; and

an optical imaging device for detecting bioluminescent signals emitted from the object using a second imaging modality to produce a bioluminescent source distribution in the object~~,~~ based on the mapped optical properties, wherein the bioluminescent source distribution is produced based on a single- or a multi-spectral radiative transport equation or an approximation to the multi-spectral radiative transport equation.

17. (**Original**) The system of claim 16, wherein the first reconstructed image shows two or three dimensional structural details of the object.

18. (**Previously Presented**) The system of claim 16, wherein the bioluminescent source distribution shows two or three dimensional distribution of light emission from the object.

19. (**Previously Presented**) The system of claim 16, wherein the bioluminescent source distribution is reconstructed to represent multiple types of source distributions with various spectral characteristics.

20. (**Previously Presented**) The system of claim 16, wherein the bioluminescent source distribution is reconstructed from a single or multiple angles of view.

21. (**Previously Presented**) The system of claim 16, wherein the bioluminescent source distribution is reconstructed using an iterative or analytic approach.

22. (**Previously Presented**) The system of claim 16, wherein the optical imaging device uses sensors for detecting the optical signal emissions.

23. (**Previously Presented**) The system of claim 22, wherein the optical imaging device further comprises optical path components.

24. (**Previously Presented**) The system of claim 16, wherein the bioluminescent source distribution shows cross-sectional or volumetric views or quantitative features of the underlying source distribution(s).

25. (**Original**) The system of claim 16, wherein the optical properties include at least one of absorption coefficients, scattering coefficients, scattering anisotropy, indices of refraction, and features of underlying sources.

26. (**Previously Presented**) The system of claim 16, wherein the tomographic imaging modality includes at least one of x-ray computed tomography scan, micro computed tomography scan, magnetic resonance imaging, and ultrasound.

27. (**Previously Presented**) The system of claim 16, wherein the optical imaging modality includes at least one of bioluminescent tomography and fluorescent tomography.

28. (**Original**) The system of claim 16, wherein the processor segments the first reconstructed image into regions and maps the optical properties to each segmented region of the image.

29. (**Previously Presented**) The system of claim 16, wherein the processor registers the first reconstructed image with the detected optical signals before the bioluminescent source distribution is produced.

30. (**Original**) The system of claim 29, wherein the processor performs registration using a landmark-based method, a landmark-free method, or an optical surface imager based method.

31. (Withdrawn) A method for obtaining a representation of a light source distribution in an object, comprising:

mapping optical properties onto an image corresponding to the object;

detecting optical signals emitted from the object; and

reconstructing a representation of the light source distribution based on the mapped optical properties and the detected optical signals.

32. (Withdrawn) The method of claim 31, wherein the reconstructed representation comprises one or more parameters of the light source distribution.

33. (Withdrawn) The method of claim 31, wherein the reconstructed representation comprises an image of the light source distribution.

34. (Withdrawn) The method of claim 31, wherein the object is heterogeneous.

35. (Withdrawn) The method of claim 34, wherein the object is an animal.

36. (Withdrawn) The method of claim 31, wherein the image corresponding to the object is heterogeneous.

37. (Withdrawn) The method of claim 36, wherein the image corresponding to the object is derived from an animal.

38. (Withdrawn) The method of claim 31, wherein the image corresponding to the object is stored in a storage device.

39. (Withdrawn) The method of claim 31, wherein the image corresponding to the object is derived from image data stored in a storage device.

40. (Withdrawn) The method of claim 31, wherein the optical properties are approximately mapped onto the image corresponding to the object.

41. (Withdrawn) The method of claim 31, wherein the optical properties are accurately mapped onto the image corresponding to the object.

42. (Withdrawn) The method of claim 31, wherein the image corresponding to the object is an image volume.

43. (Withdrawn) The method of claim 31, wherein the image corresponding to the object comprises one or more image slices corresponding to the object.

44. (Withdrawn) The method of claim 31, wherein the image corresponding to the object shows one or more two or three dimensional structural details that correspond to the object.

45. (Withdrawn) The method of claim 33, wherein the image of the light source shows two or three dimensional distribution of light emission in the object.

46. (Withdrawn) The method of claim 33, wherein the image of the light source is reconstructed for multiple types of source distributions with various spectral characteristics.

47. (Withdrawn) The method of claim 33, wherein the image of the light source is reconstructed from a single or multiple angles of view.

48. (Withdrawn) The method of claim 31, wherein the image of the light source is reconstructed using an iterative or analytic approach.

49. (Withdrawn) The method of claim 31, wherein the step of detecting optical signals uses one or more sensors.

50. (Withdrawn) The method of claim 49, wherein the step of detecting optical signals also uses optical path components.

51. (Withdrawn) The method of claim 31, wherein the image of the light source shows a cross-sectional or volumetric view of the light source or quantitative features of underlying light source distributions in the object.

52. (Withdrawn) The method of claim 31, wherein the optical properties include at least one of absorption coefficients, scattering coefficients, scattering anisotropy, indices of refraction, and features of underlying sources.

53. (Withdrawn) The method of claim 31, wherein the image corresponding to the object can be derived from image data produced by at least one of x-ray computed tomography, micro computed tomography, magnetic resonance imaging, and ultrasound.

54. (Withdrawn) The method of claim 53, wherein the image corresponding to the object is stored in a storage device.

55. (Withdrawn) The method of claim 53, wherein the image data is stored in a storage device.

56. (Withdrawn) The method of claim 31, wherein the optical signals are detected using an imaging modality that includes at least one of bioluminescent tomography and fluorescent tomography.

57. (Withdrawn) The method of claim 31, further comprising segmenting the image corresponding to the object into regions, wherein the step of mapping maps the optical properties to each segmented region of the image.

58. (Withdrawn) The method of claim 31, further comprising registering the image corresponding to the object with the detected optical signals for reconstructing a representation of the light source distribution.

59. (Withdrawn) The method of claim 58, wherein the step of registering uses a landmark-based method, a land-mark free method, or an optical surface imaging method.

60. (Withdrawn) The method of claim 31, wherein the optical signals are emitted from a light source comprising a bioluminescent or fluorescent emission.

61. (Withdrawn) The method of claim 60, wherein the object is an animal and the light source emits light that passes through the animal tissues.

62. (Withdrawn) A system for obtaining a representation of a light source distribution in an object, comprising:

a processor for mapping optical properties onto an image corresponding to the object; and

a device for detecting optical signals emitted from the object and for reconstructing a representation of the light source distribution based on the mapped optical properties and the detected optical signals.

63. (Withdrawn) The system of claim 62, wherein the reconstructed representation comprises one or more parameters of the light source distribution.

64. (Withdrawn) The system of claim 62, wherein the reconstructed representation comprises an image of the light source distribution.

65. (Withdrawn) The system of claim 62, wherein the mapped optical properties are obtained from a database of optical properties.

66. (Withdrawn) The system of claim 62, wherein the mapped optical properties are obtained from the object.

67. (Withdrawn) The system of claim 62, wherein the object is heterogeneous.

68. (Withdrawn) The system of claim 62, wherein the object is an animal.

69. (Withdrawn) The system of claim 62, wherein the image corresponding to the object is heterogeneous.

70. (Withdrawn) The system of claim 69, wherein the image corresponding to the object is derived from an animal.

71. (Withdrawn) The system of claim 62, wherein the image corresponding to the object is stored in a storage device.

72. (Withdrawn) The system of claim 62, wherein the image corresponding to the object is derived from image data stored in a storage device.

73. (Withdrawn) The system of claim 62, wherein the image corresponding to the object shows two or three dimensional structural details that correspond to the object.

74. (Withdrawn) The system of claim 64, wherein the image of the light source distribution shows one or more two or three dimensional distribution of light emission in the object.

75. (Withdrawn) The system of claim 64, wherein the image of the light source distribution is reconstructed for multiple types of source distributions with various spectral characteristics.

76. (Withdrawn) The system of claim 64, wherein the image of the light source distribution is reconstructed from a single or multiple angles of view.

77. (Withdrawn) The system of claim 64, wherein the image of the light source distribution is reconstructed using an iterative or analytic approach.

78. (Withdrawn) The system of claim 62, wherein the device uses sensors for detecting the optical signal emissions.

79. (Withdrawn) The system of claim 78, wherein the device further comprises optical path components.

80. (Withdrawn) The system of claim 64, wherein the image of the light source distribution shows cross-sectional or volumetric views or quantitative features of the underlying source distribution(s).

81. (Withdrawn) The system of claim 62, wherein the optical properties include at least one of absorption coefficients, scattering coefficients, scattering anisotropy, indices of refraction, and features of underlying sources.

82. (Withdrawn) The system of claim 62, wherein the image corresponding to the object can be derived from image data produced by at least one of x-ray computed tomography, micro computed tomography, magnetic resonance imaging, and ultrasound.

83. (Withdrawn) The method of claim 82, wherein the image corresponding to the object is stored in a storage device.

84. (Withdrawn) The method of claim 82, wherein the image data is stored in a storage device.

85. (Withdrawn) The system of claim 62, wherein the device includes at least one of bioluminescent tomography and fluorescent tomography.

86. (Withdrawn) The system of claim 62, wherein the processor segments the image corresponding to the object into regions and maps the optical properties to each segmented region of the image.

87. (Withdrawn) The system of claim 62, wherein the processor registers the image corresponding to the object with the detected optical signals for reconstructing a representation of the light source distribution.

88. (Withdrawn) The system of claim 87, wherein the processor performs registration using a landmark-based method, a landmark-free method, or an optical surface imager based method.

89. (Withdrawn) The system of claim 62, wherein the optical signals are emitted from a light source comprising a bioluminescent or fluorescent emission.

90. (Withdrawn) The system of claim 89, wherein the object is an animal and the light source emits light that passes through the animal tissues.